ANNUAL REPORT FOR 2002

Mashoes Road Mitigation Site

Dare County

Project No. 8.T051402

TIP No. R-2551WM

Prepared By:
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North Carolina Department of Transportation
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2002 REPORT – EXECUTIVE SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Mashoes Road Mitigation Site. Construction began on this site in 1998. The west side of Mashoes Road was completed in early 1999 and was planted with trees; this area was replanted in the Winter of 2000-01. The east side of Mashoes Road was completed in the fall of 1999 but was not planted due to *Phragmites* control. The east side of the site was planted with marsh grass in the spring of 2001. Monitoring activities in 2002 represent the second year of monitoring at the mitigation site. The site must demonstrate hydrologic and vegetation success for a minimum of five years or until the project is deemed successful.

The site contains nine groundwater monitoring gauges on the west side, ten surface gauges on the east side and one rain gauge. On the east side, there are a total of 167 random vegetation plots, while the west side has five permanent vegetation plots.

The daily rainfall data depicted on the monitoring gauge graphs is recorded from an on-site rain gauge. Historical rainfall data used for the 30-70 percentile was recorded at the Manteo rain gauge, maintained by the NC State Climate Office.

Hydrologic monitoring indicated that the site is continuing toward success. Under normal conditions for 2002, all nine of the groundwater gauges met the jurisdictional hydrologic success for at least 12.5% of the growing season. All ten of the surface gauges showed steady tidal influence that maintained a water elevation above zero under normal conditions for at least 25% of the growing season.

Vegetation monitoring on the west side, (Tree Area) of the restoration area yielded 639 trees per acre, above the 320 tree requirement. On the east side (Marsh Grasses Area), a frequency of 54.0% for the targeted vegetative species was found. A frequency of 70% is required. A vegetative scale value of 3.92 was recorded. A scale value of 5 is required by year 5.

Based on the monitoring results for this growing season, NCDOT proposes to continue hydrologic and vegetation monitoring.

1.0 INTRODUCTION

1.1 Project Description

The Mashoes Road Wetland Mitigation Site is located north of Manns Harbor in Dare County (Figure 1). It is bounded by US 64-264 to the south, the Alligator River National Wildlife Refuge to the west, the Croatan Sound to the east, and is bisected into east/west by SR 1113 (Mashoes Road).

A significant portion of the site (254 acres) was classified as a coastal marsh and fell under the jurisdiction of the N.C. Division of Coastal Management. Another portion (107 acres) was classified as forested wetlands. The remainder of the site was comprised of a 15-acre pond, borrow pits and cleared uplands from a sand mining operation, and some forested uplands.

The site encompasses approximately 399 acres and is designed as a mitigation site primarily for the new Croatan Sound Bridge between Manns Harbor and Manteo , TIP Projects R-2551 and K-4003 (USACE Action ID No. 199502334).

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until success criteria are fulfilled. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during 2002 at the Mashoes Road Mitigation Site.

Activities in 2002 reflect the second year of monitoring at the mitigation site. Included in this report are analyses of both hydrologic and vegetative monitoring results as well as local climate conditions throughout the growing season.

1.3 Project History

Winter 1999	West Side Construction Complete
Spring 1999	Wetland Trees Planted (West Side)
Spring 1999	East Side Construction Complete
March 1999	Monitoring Gauges Installed (Entire Site)
March – November 1999	Hydrologic Monitoring (Entire Site, Year 1)
October 1999	Vegetation Monitoring (West Side, Year 1)
March – November 2000	Hydrologic Monitoring (Entire Site, Year 2)
October 2000	Vegetation Monitoring (West Side, Year 2)
October 2000	*Phragmites* Treated
March – November 2001	Hydrologic Monitoring (Entire Site, Restart Year 1)
April 2001	*Phragmites* Treated
May 2001	Marsh Grasses Planted
August 2001	Tree Vegetation Monitoring (Restart Year 1)
August 2001	Marsh Vegetation Monitoring (Year 1)
July 2002	Tree Vegetation Monitoring (Year 2)
July 2002	Marsh Vegetation Monitoring (Year 2)
November 2002	*Phragmites* Treated

1.4 Debit Ledger

Because of its size, Mashoes Road will provide mitigation for several highway projects. Table 1 shows the projects that this site is providing mitigation for through November 2001.

Table 1

Mashoes Road Debit Ledger

Habitat	Acres at Start	Acres Remaining	TIP Debit R-2551	TIP Debit K-4003
SVM Restoration	13.1	0	13.1	0
Forest Wetlands Restoration	8	0	8	0
SVM Preservation	253.86	130.96	122.9	0
Forest Wetland Preservation	106.88	29.32	76.2	1.36
Open Water	15.53	15.53	0	0
Upland Hummocks	1.48	1.48	0	0
Total:	398.85	177.29	220.2	1.36

1.5 Permit Requirements

The Mashoes Road Mitigation Site was constructed primarily to compensate for impacts to TIP Project R-2551 (USACE Action ID No. 199502334). Permit commitments stated that *Phragmites australis* would be totally controlled in the marsh area.

The permit was modified in 2000, which allowed for marsh planting to be extended to the spring of 2001. This gave NCDOT additional time to further treat for phragmites.

The site was treated for *Phragmites* in 2000, 2001, and 2002. The planting of marsh grass at the site was completed in spring 2001.

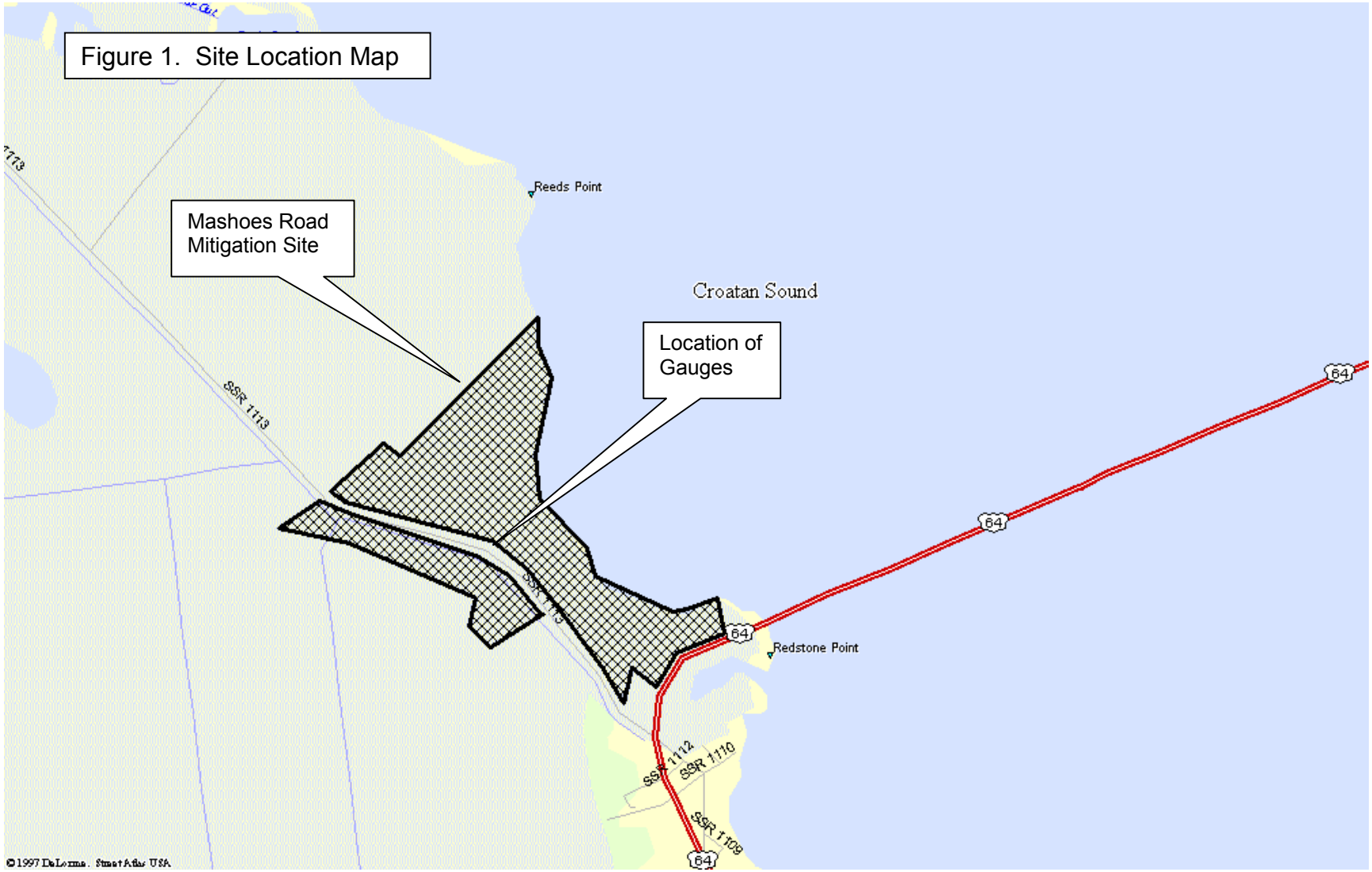
Figure 1. Site Location Map
Mashoes Road Mitigation Site
Location of Gauges
Reeds Point
Croatan Sound
Redstone Point
SSR 1113
SSR 1112
SSR 1110
SSR 1109
64
64
64
64
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2.0 HYDROLOGY

2.1 Success Criteria

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology in the forested wetland (west side) states that the area must be inundated or saturated (within 12 inches of the surface) by surface or ground water for at least 12.5% of the growing season. Areas inundated less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% - 12.5% of the growing season can be classified as wetlands depending upon other factors, such as the presence of hydrophytic vegetation and hydric soils.

In the coastal marsh wetland (east side), success criteria include saturation or inundation within 12 inches of the surface for at least 25% of the growing season, or statistically the same as the reference ecosystem.

The growing season in Dare County begins March 13 and ends November 25. The dates correspond to a 50% probability that temperatures will drop to 28^{o} F or lower after March 13 and before November 25.[1] The growing season is 258 days; therefore the optimum duration for wetland hydrology is 32 days. Also, local climate must represent average conditions for the area.

2.2 Hydrologic Description

Historically, the wetlands on this tract were part of the coastal marsh of the surrounding area. The primary sources of hydrology are tidal flushing of the system and groundwater. After an extensive study of the site's hydrology, it was concluded that filling of the ponds, and grading down of the upland areas would elevate soils to a level that would saturate the soil stratum within the required twelve inches or even flood the area during high tides. It was predicted that this would be sufficient to restore wetland hydrology.

Six groundwater monitoring gauges, eight surface gauges, and one rain gauge were installed in 1999 (Figure 2). Three more groundwater monitoring gauges were installed during 2001 to evaluate potential drainage by the side canal. Also, two additional surface gauges were added to the coastal marsh wetland area. The rain gauge and monitoring gauges recorded daily readings of rainfall and depth to groundwater, respectively. The surface gauges record tidal conditions eight times daily; however, only one representative reading was used for graphing and statistical purposes in this report.

[1] Natural Resources Conservation Service, Soil Survey of Dare County, North Carolina, p.69.

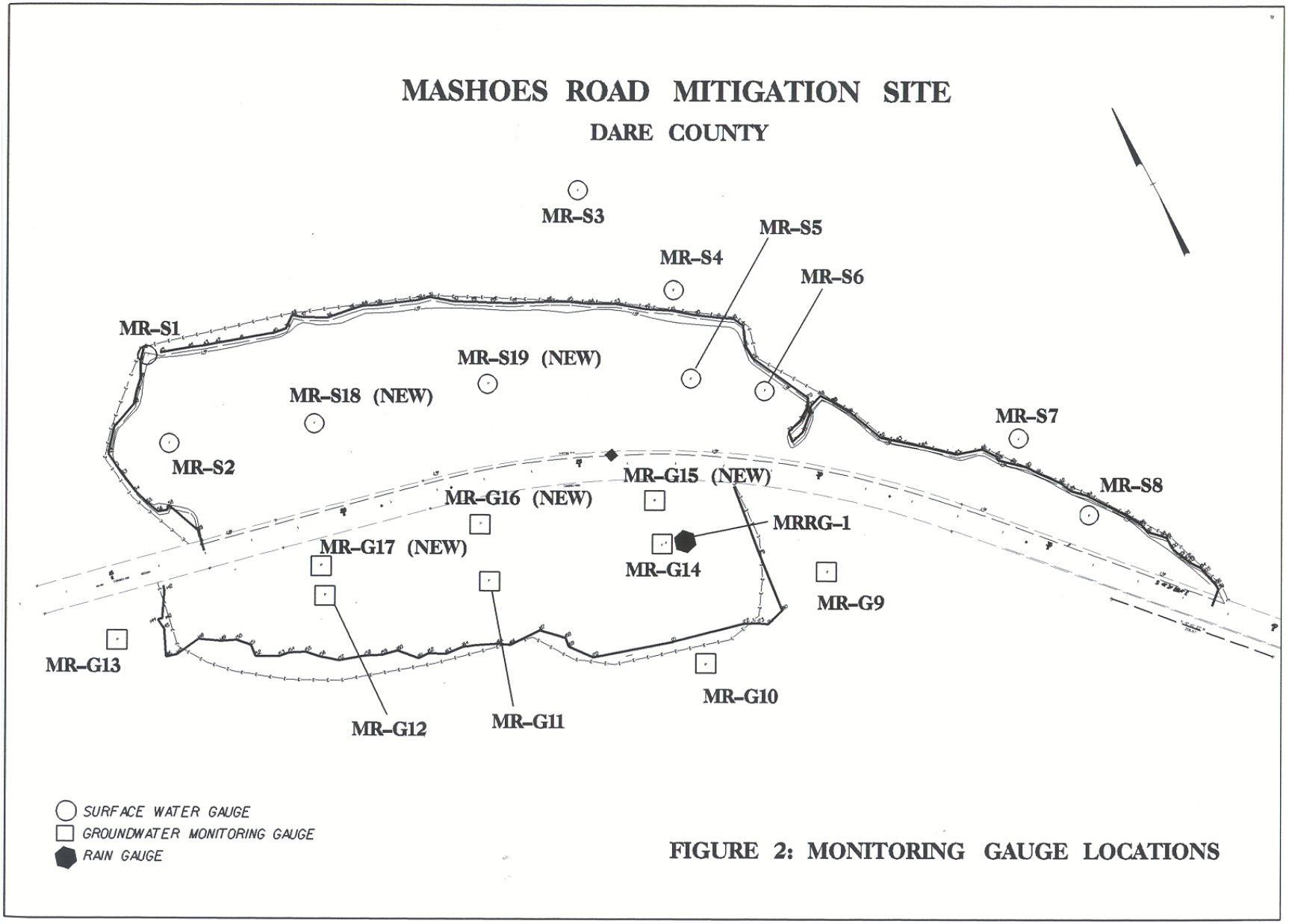


FIGURE 2: MONITORING GAUGE LOCATIONS

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

For groundwater monitoring gauges on the west side of the mitigation site, the maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. For surface gauges, the ground surface was used (elevation zero) to give a better representation that the east side of Mashoes Road was receiving daily tidal flooding. This number was converted into a percentage of the 256-day growing season. Table 2 presents the 2002 results. In the table, "MR" refers to Mashoes Road Mitigation Site, "S" refers to surface gauges, and "G" refers to groundwater gauges. Reference gauges and new gauges are indicated.

In order to meet the success criteria for hydrology, the surface water gauges needs to maintain a water elevation above 0 for at least 25% of the growing season. Since the criteria in the mitigation plan were unclear whether hydrology should be met in maximum consecutive days or total days, the table shows both sets of data.

Appendix A contains a plot of the groundwater depth for each monitoring gauge. The maximum number of consecutive days that the gauge met success above this 12-inch depth is noted on each graph. Data determined to be erroneous was omitted; therefore, some gaps appear in the plots.

Precipitation events are included on each graph as bars.

Table 2
2002 HYDROLOGIC MONITORING RESULTS
(MARCH 13 – NOVEMBER 25)

Monitoring Gauge	< 5%	5 - 8%	8 – 12.5%	> 12.5%	Maximum Consecutive Days >25%	Total Days	Success Dates
MR-S1 (ref)				✓	**36.1%**	**79.8%**	
MR-S2				✓	**56.6%**	**98.1%**	
MR-S3 (ref)				✓	100%	**100.0%**	
MR-S4 (ref)				✓	37.7%	98.4%	
MR-S5				✓	36.1%	72.6%	
MR-S6				✓	38.4%	95.8%	
MR-S7 (ref)				✓	36.1%	62.7%	
MR-S8				✓	100%	100%	
MR-G9 (ref)*				✓	36.1		3/13-6/4 8/25-11/25
MR-G10 (ref)				✓	31.4		3/13-6/1 7/11-9/7
MR-G11				✓	50.0		3/13-5/23 7/20-11/25
MR-G12				✓	36.1		3/13-5/20 8/25-11/25
MR-G13 (ref)				✓	16.7		3/13-4/24 8/22-9/30
MR-G14				✓	50.0		3/13-6/87
MR-G15				✓	36.1		3/13-7/20
MR-G16				✓	36.1		3/13-5/15 8/25-11/25
MR-G17				✓	50.4		3/13-5/20 7/19-11/25
MS-S18				✓	54%	99.3%	
MS-S19				✓	36.1%	89.1%	

* Gauge experienced malfunction, however it appears to have met saturation level of at least 12 inches of the surface.

Notes: "MR" denotes Mashoes Road site gauges.
"S" denotes surface gauges.
"G" denotes groundwater gauges.
"ref" denotes gauges in reference wetlands.

Specific Gauge Problems:

- MR-9 experienced gauge malfunction and stopped recording data (March 25-April 17)
- MR-9 experienced gauge malfunction and stopped recording data (June 2-July 10)
- MR-13 experienced gauge malfunction (April 25-July 10). The gauge was replaced.

Figure 3 represents a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 12.5% of the growing season. Gauges highlighted in red show hydrology between 8% and 12.5% of the season, while those in green indicate hydrology between 5% and 8% of the season. Gauges highlighted in white indicate no wetland hydrology (less than 5% of the growing season).

For this time period from March to November, all nine groundwater gauges met the jurisdictional hydrologic success of at least 12.5% during the growing season.

It is unclear whether the surface gauge criteria should be met in maximum consecutive days or total days, so the table shows both sets of data. When considering the maximum consecutive days, all ten surface gauges recorded that flooding occurred at least 25% of the growing season. If the total number of days are considered, all ten gauges also met the hydrologic requirements.

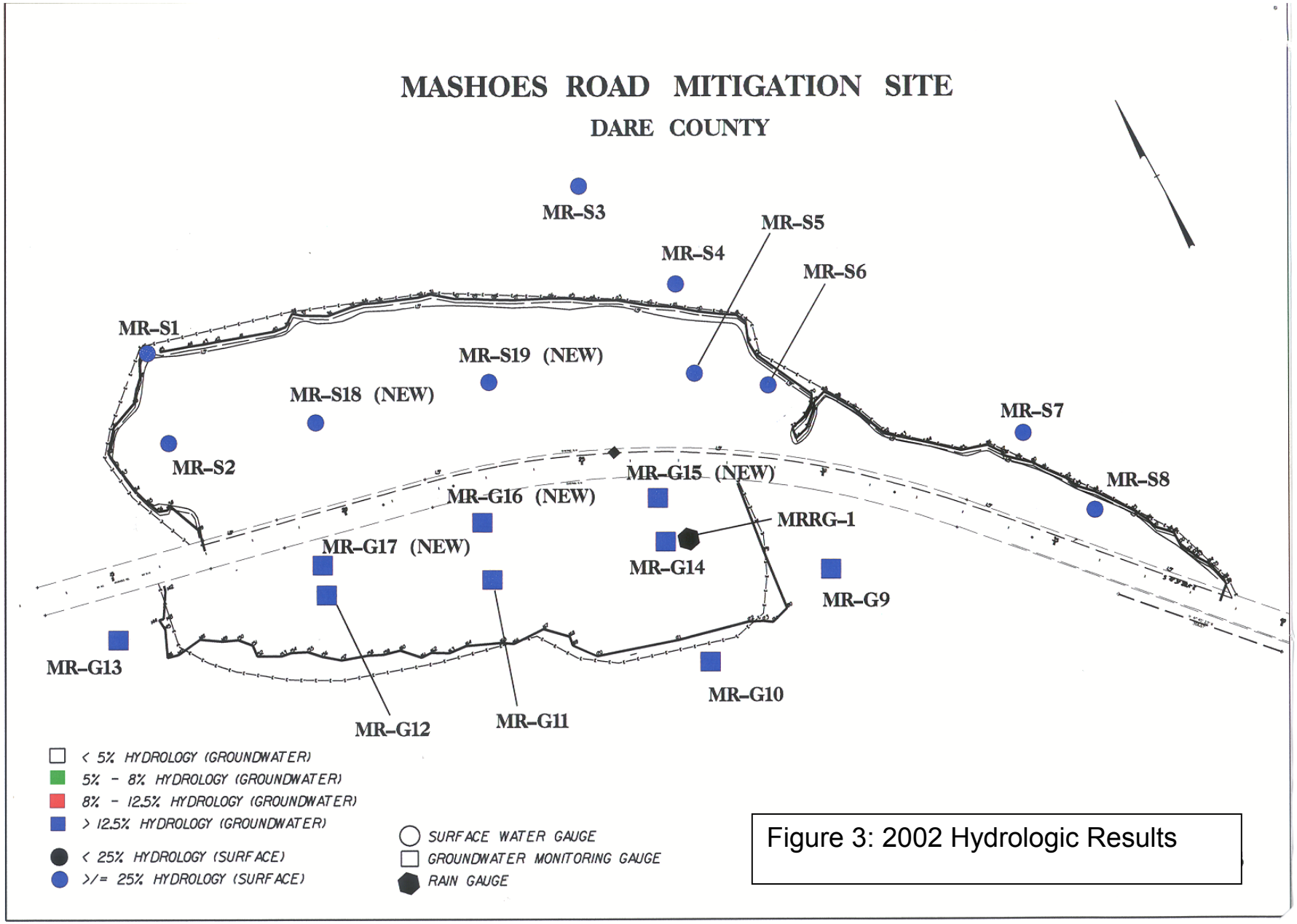


Figure 3: 2002 Hydrologic Results

2.3.2 Climatic Data

Figure 4 represents an examination of the local climate in comparison with historical data in order to determine whether 2002 was "average" in terms of climate conditions. The two lines represent the 30th and 70th percentiles of monthly precipitation for Manteo, NC. The bars are monthly rainfall totals for 2001 and 2002. The historical data was collected from the State Climate Office of North Carolina. Rainfall data from the Manteo rain gauge was not available for months of August-November. For these particular months, the onsite rain gauge at Mashoes Road was used for the monthly rainfall.

According to the Manteo weather station and Mashoes rain gauge, November 01, December 01, February, April, May, and June experienced below average rainfall. The months of January and November all recorded average rainfall for the site. March, July, August, September, and October experienced above average rainfall. Overall 2002 experienced an average year in terms of rainfall.

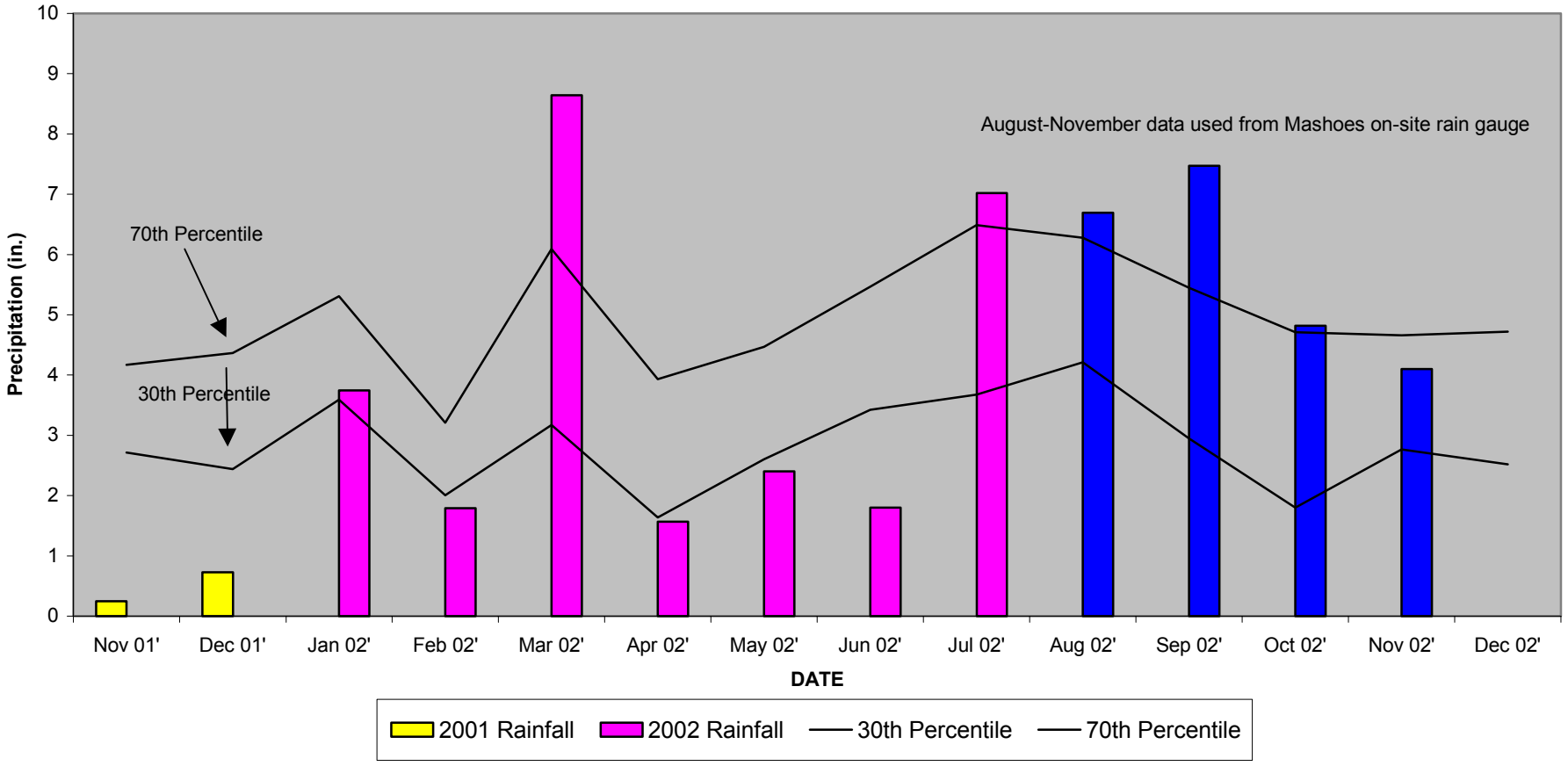
2.4 Conclusions

2002 represents the fourth full growing season (but the second official season) that the hydrologic data has been examined. All nine groundwater monitoring gauges met the jurisdictional wetland hydrology for 12.5% of the growing season; when considering maximum cumulative days, all ten surface gauges met the 25% requirement of daily flooding the site during this same period.

The overall monitoring results show that the site performed successfully from a hydrological standpoint.

FIGURE 4

Mashoes Road 30-70 Percentile Graph 2002
Manteo, NC



3.0 VEGETATION: MASHOES ROAD MITIGATION SITE (YEAR 2 MONITORING)

3.1A Success Criteria (Trees)

NCDOT will monitor the site for five years or until success criteria is met. A 320 stems per acre survival criterion for planted seedlings will be used to determine success for the first three years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5). The number of plants of one species will not exceed 20% of the total number of plants of all species planted.

3.1B Success Criteria (Marsh Grasses)

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. Monitoring plots found to be located within the open water channel will not count to the final count of plots. The vegetation component of the wetland site will be deemed successful if the following criteria are met.

1. At year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.
2. A minimum of 70% of the plots shall contain the target (planted) species.

3.2A Description of Species

The following species were planted in the Wetland Restoration Area:

Zone 1: Wetland Tree Reforestation (2.7 acres)

Taxodium distichum, Baldcypress

Quercus phellos, Willow Oak

Nyssa sylvatica var. *sylvatica*, Blackgum

Fraxinus pennsylvanica, Green Ash

Quercus nigra, Water Oak

Zone 2: Wetland Tree Reforestation (4.3 acres)

Taxodium distichum, Baldcypress

Fraxinus pennsylvanica, Green Ash

Quercus nigra, Water Oak

Quercus phellos, Willow Oak

3.2B Description of Species

The following plant communities were planted in the Marsh Grass Area:

Zone 1: (approximately 11.92 acres)

Cladium jamaicense, Sawgrass

Zone 2: (approximately 0.42 acres)

Juncus roemerianus, Black Needle Rush

3.3A Results of Vegetation Monitoring

Table 3: Vegetation Results (Tree Area)

ZONE	Plot #	Green Ash	Willow Oak	Baldcypress	Blackgum	Water Oak	Total (2 yr.)	Total (at planting)	Density (trees/acre)
1	1	13	5	5	5	1	29	40	493
	2	19	7	9	5	0	40	40	680
					ZONE 1 AVERAGE				**587**
2	3	8	2	31	0	4	45	49	624
	4	10	7	13	0	1	31	32	659
	5	4	10	10	0	3	27	35	525
					ZONE 2 AVERAGE				**603**
					TOTAL AVERAGE				**596**

Site Notes: Other species noted: *Scirpus americanus*, sawgrass, black needle rush, *Bidens* sp., ragweed, *Baccharis halimifolia*, fennel, phragmites, redbay, cattail, red maple, and *Pluchea* sp. Trees were difficult to find in plot 1 due to heavy herbaceous vegetation.

TABLE 4: Vegetation Results (Marsh Grass Area)

ZONE	Plot #	Scale Factor	Black Needle Rush	Sawgrass	Frequency	Notes
	1	5.0				Phragmites, *Scirpus americanus* , *Pluchea* sp.
	2	5.0		✓	✓	Phragmites, *Eleocharis sp.*
	3	5.0				dog fennel, *Melothria pendula, Panicum* sp.
	4	5.0		✓	✓	Phragmites, *Scirpus* sp.,
	5	2.0		✓	✓	Phragmites
	6	3.0		✓	✓	
	7	2.0		✓	✓	
	8	2.0				*Pluchea sp*., Phragmites
	9	5.0		✓	✓	*Scirpus robustus, Pluchea* sp., *Baccharis* sp.
	10	5.0				Phragmites, *Scirpus americanus, Pluchea* sp., dog fennel
	11	3.0				*Aster* sp.
	12	5.0				*Scirpus americanus, Scirpus robustus*
	13	5.0		✓	✓	Phragmites, climbing hemp weed
	14	3.0				
	15	5.0		✓	✓	Phragmites
	16	2.0				Phragmites, *Aster* sp.
	17	5.0				Phragmites
	18	5.0		✓	✓	Phragmites, Foxtail grass, dog fennel.
	19	4.0		✓	✓	Phragmites, *Spartina patens, Aster* sp.
	20	4.0		✓	✓	*Scirpus americanus*
	21	2.0		✓	✓	*Panicum sp.*
	22	5.0		✓	✓	Phragmites, *Scirpus americanus*
	23	0.0				bare ground
	24	5.0				Phragmites, *Baccharis sp.*
	25	5.0				*Aster sp., Scirpus americanus*
	26	0.0				open water
	27	5.0		✓	✓	Phragmites, cattails
	28	5.0		✓	✓	Phragmites, *Scirpus americanus, Juncus* sp.
	29	5.0		✓	✓	*Paspulum* sp.
	30	5.0		✓	✓	Phragmites, dog fennel, *Pluchea* sp., *Baccharis* sp., *Aster* sp.
	31	5.0		✓	✓	Phragmites, cattail
	32	4.0		✓	✓	*Scirpus americanus, dog fennel, Eleocharis* sp.
	33	3.0				Phragmites
	34	5.0				Phragmites, *Baccharis* sp.
	35	5.0		✓	✓	Phragmites, *Scirpus americanus*
	36	5.0				*Scirpus americanus*
	37	5.0		✓	✓	*Scirpus americanus*
	38	5.0		✓	✓	Phragmites, dog fennel, climbing hempweed, *Eleocharis* sp.
	39	3.0				Phragmites, *Juncus* sp., *Scirpus americanus*
	40	3.0				*Scirpus americanus*
	41	3.0				*Paspulum* sp.
	42	5.0		✓	✓	Phragmites, *Scirpus americanus, Baccharis* sp.
	43	3.0		✓	✓	
	44	5.0		✓	✓	Phragmites
	45	5.0		✓	✓	*Pluchea* sp.
	46	3.0		✓	✓	

TABLE 4: Vegetation Results (Marsh Grass Area)

ZONE	Plot #	Scale Factor	Black Needle Rush	Sawgrass	Frequency	Notes
	47	4.0		✓	✓	Phragmites
	48	3.0		✓	✓	
	49	4.0		✓	✓	Phragmites, *Spartina patens*
	50	3.0		✓	✓	
	51	3.0		✓	✓	Phragmites
	52	5.0		✓	✓	Phragmites, cattail, dog fennel, climbing hemp weed
	53	5.0		✓	✓	Phragmites
	54	4.0		✓	✓	Phragmites
	55	3.0		✓	✓	Phragmites, *Juncus* sp.
	56	3.0		✓	✓	*Pluchea* sp., *Aster* sp.
	57	5.0		✓	✓	*Pluchea* sp.
	58	5.0				Phragmites, *Baccharis s*p.
	59	5.0				Phragmites, dog fennel, *Panicum* sp., *Aster* sp.
	60	0.0				open water
	61	3.0		✓	✓	*Phragmites, B*ermuda grass
	62	3.0		✓	✓	*Juncus roemerianus, Scirpus* sp.
	63	5.0				Phragmites, *Paspalum* sp.
	64	5.0		✓	✓	Phragmites, *Pluchea* sp.
	65	3.0				Soft stem scirpus, Phragmites, *Scirpus robustus*
	66	4.0		✓	✓	Phragmites, *Spartina patens, Aster sp.*
	67	3.0				Scirpus americana
	68	5.0		✓	✓	Phragmites, *Scirpus americanus, Eleocharis sp.* ,
	69	5.0				Phragmites, *Baccharis* sp.
	70	3.0		✓	✓	Bermudagrass, Phragmites, *Aster* sp.
	71	0.0				Bare ground
	72	3.0				Redstem, *Aster* sp.
	73	5.0		✓	✓	Phragmites, *Scirpus americanus*
	74	5.0		✓	✓	Phragmites, *Pluchea* sp., *Aster* sp.
	75	5.0		✓	✓	Phragmites
	76	5.0		✓	✓	Phrag., pennywort, Sc. americsanus., climbing hempw., purplestemgrass
	77	5.0		✓	✓	*Scirpus* sp., *Baccharis* sp.
	78	5.0				*Scirpus americana, Paspalum* sp.
	79	5.0		✓	✓	Phragmites
	80	5.0		✓	✓	Phragmites, *Scirpus americanus* ,
	81	0.0				Bare ground
	82	5.0				Phragmites, *Baccharis* sp.
	83	5.0		✓	✓	Phragmites
	84	3.0		✓	✓	*Aster* sp., *Scirpus* sp.
	85	5.0		✓	✓	Phragmites, *Scirpus* sp., *Pluchea* sp.
	86	5.0		✓	✓	*Scirpus americanus, Scirpus robustus*
	87	5.0		✓	✓	*Scirpus americanus,* cattail
	88	5.0				Phragmites, climbing hempweed, *Aster* sp., *Eleocharis* sp., *Pluchea* sp.,
	89	5.0		✓	✓	Phragmites
	90	2.0				Dog fennel, *Aster* sp., *Spartina patens*
	91	3.0		✓	✓	Phragmites, climbing hempweed
	92	3.0		✓	✓	Phragmites, *Aster* sp., *Pluchea* sp.

TABLE 4: Vegetation Results (Marsh Grass Area)

ZONE	Plot #	Scale Factor	Black Needle Rush	Sawgrass	Frequency	Notes
	139	2.0				*Scirpus* sp., *Cyperus* sp., cattail
	140	5.0				*Scirpus robustus, Juncus scirpoides, Baccharis* sp., *Pluchea* sp., *Paspalum* sp.
	141	2.0				Phragmites, *Juncus scirpoides, Scirpus robustus*
	142	5.0		✓	✓	*Panicum* sp., *Aster* sp., *Juncus scirpoides*
	143	3.0				*Scirpus americanus, Spatina patens, Aster* sp., *Pluchea* sp., dog fennel
	144	3.0		✓	✓	Phragmites, dog fennel, climbing hempweed, *Cyperus* sp., *Ludwigia sp., Rhynchospora sp.*
	145	2.0				*Panicum* sp.,
	146	2.0				*Scirpus americanus*
	147	2.0				Phragmites, *Juncus elliottii, Spartina patens, Juncus canadensis*
	148	5.0				*Scirpus robustus, Aster* sp., *Pluchea* sp.
	149	5.0				*Aster sp., Scirpus sp., Baccharis* sp.
	150	2.0				*Panicum* sp.,
	151	5.0				*Aster* sp., *Scirpus* sp., *Baccharis* sp.
	152	3.0				Phragmites, *Scirpus americanus, Juncus scirpoides, Spartina patens*
	153	2.0				*Spartina patens, Pluchea* sp., *Juncus elliottii*
	154	2.0				*Scirpus* sp., *Cyperus* sp., cattail
	155	3.0				*Panicum* sp., *Aster* sp., *Cyperus* sp.
	156	4.0				*Scirpus americanus, Scirpus robustus, Baccharis* sp., climbing hempweed
	157	2.0				*Juncus* sp., *Pluchea* sp., goldenrod
	158	5.0	✓		✓	*Aster* sp.
	159	5.0				*Scirpus americanus,* barnyard grass
	160	4.0	✓		✓	*Scirpus* sp., *Aster* sp., *Baccharis* sp.
	161	4.0	✓		✓	*Scirpus. americanus., Juncus sp., Aster sp., Pluchea* sp. *Baccharis* sp. bermuda grass
	162	5.0				*Scirpus americanus,* scirpus, barnyard grass
	163	4.0	✓		✓	Phragmites, *Aster* sp., *Scirpus robustus*
	164	5.0	✓		✓	Phragmites, *Juncus* sp., *Scirpus robustus*
	165	3.0		✓	✓	Phragmites, *Scirpus robustus*
	166	5.0	✓			*Scirpus americanus,* goldenrod
	167	3.0		✓	✓	Phragmites, *Scirpus robustus*
Frequency/Percentage Plots with Desired Species					**54.0%**	
Sum Scale Value					**639**	
Total # of Plots					**163**	
Vegetative Cover (Scale Value)					**3.92**	

3.4A Conclusions (Tree Area)

Of the 399 acres on this site, approximately 7 acres involved tree planting. This side of the site has become extremely well vegetated with marsh grasses. There were 5 plots established throughout the planting areas, encompassing all plant communities. The 2002 vegetation monitoring revealed an average density of 639 trees per acre, which is well above the 320 trees per acre required by the success criteria.

3.4B Conclusions (Marsh Area)

- Percent Frequency of Target Species **54.0%**

  Frequency of 70% required.

- Vegetative Cover Scale Value **3.92**

  Scale Value of 5 required for year 5.

Of the 399 acres on this site, approximately 12.34 acres involved marsh grass planting. There were 167 random plots established throughout the planting areas, encompassing all plant communities. These plots were located with GPS. The northern side of the site was treated for phragmites in April 2001. The phragmites will continue to be treated throughout the monitoring period. The vegetative coverage and frequency do not currently meet the success criteria. However, the vegetative coverage and frequency do appear to be on track for year two.

NCDOT will continue vegetation monitoring at the Mashoes Road Mitigation Site.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

2002 represents the fourth full growing season (but the second official season) that the hydrologic data has been examined. All nine groundwater monitoring gauges met the jurisdictional wetland hydrology for 12.5% of the growing season; when considering maximum cumulative days, all ten surface gauges met the 25% requirement of daily flooding the site during this same period. The overall monitoring results show that the site performed successfully from a hydrological standpoint.

Vegetation monitoring on the west side (Tree Area) of the restoration area yielded 639 trees per acre, above the 320 tree requirement. On the east side (Marsh Grasses Area), a frequency of 54.0% for the targeted vegetative species was found. A frequency of 70% is required. A vegetative scale value of 3.92 was recorded. A scale value of 5 is required by year 5.

NCDOT will continue to monitor the site for both hydrologic and vegetation success.

APPENDIX A

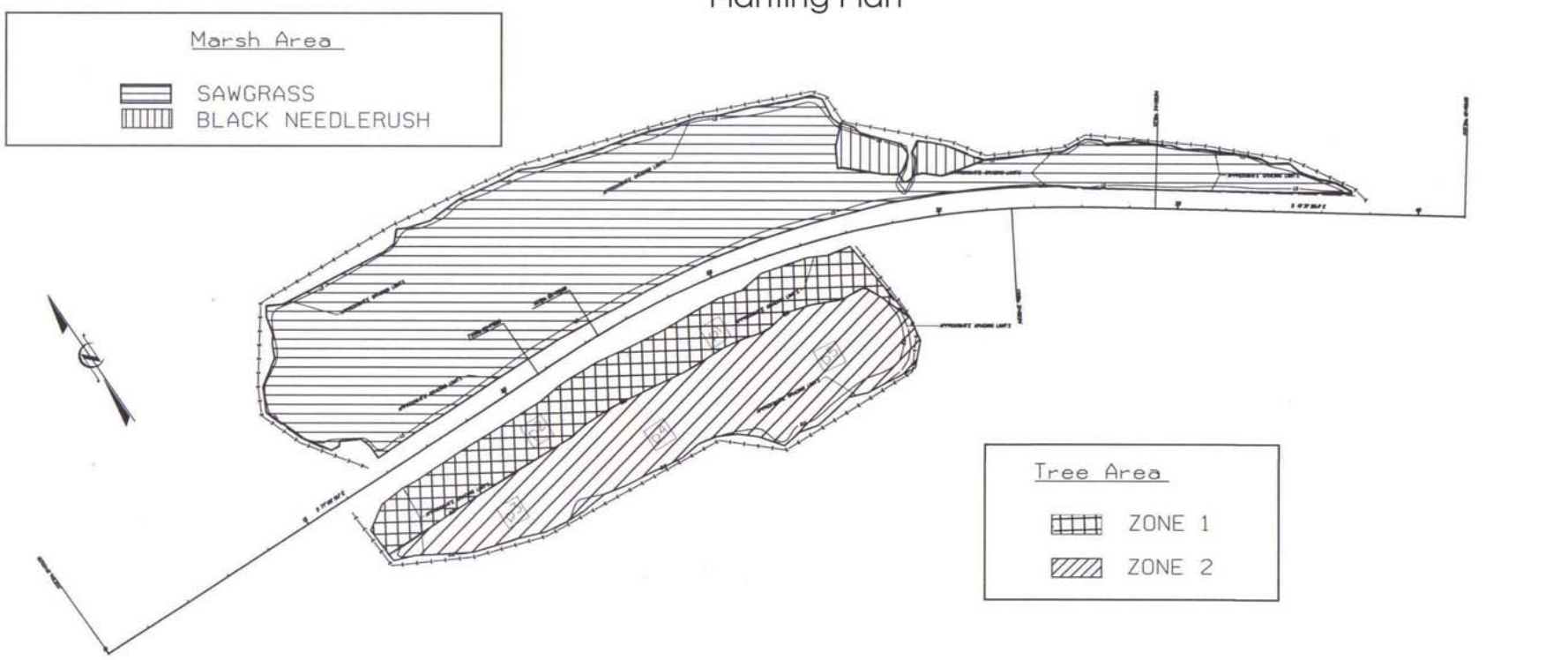
DEPTH TO GROUNDWATER & SURFACE WATER GRAPHS

APPENDIX B

PHOTO AND VEGETATION PLOT LOCATIONS, SITE PHOTOS

PROJ. REFERENCE NO.	SHEET NO.	TOTAL SHEETS
R-2551WM	WM-1	
STATE PROJECT NO.	F.A. PROJ. NO.	DESCRIPTION

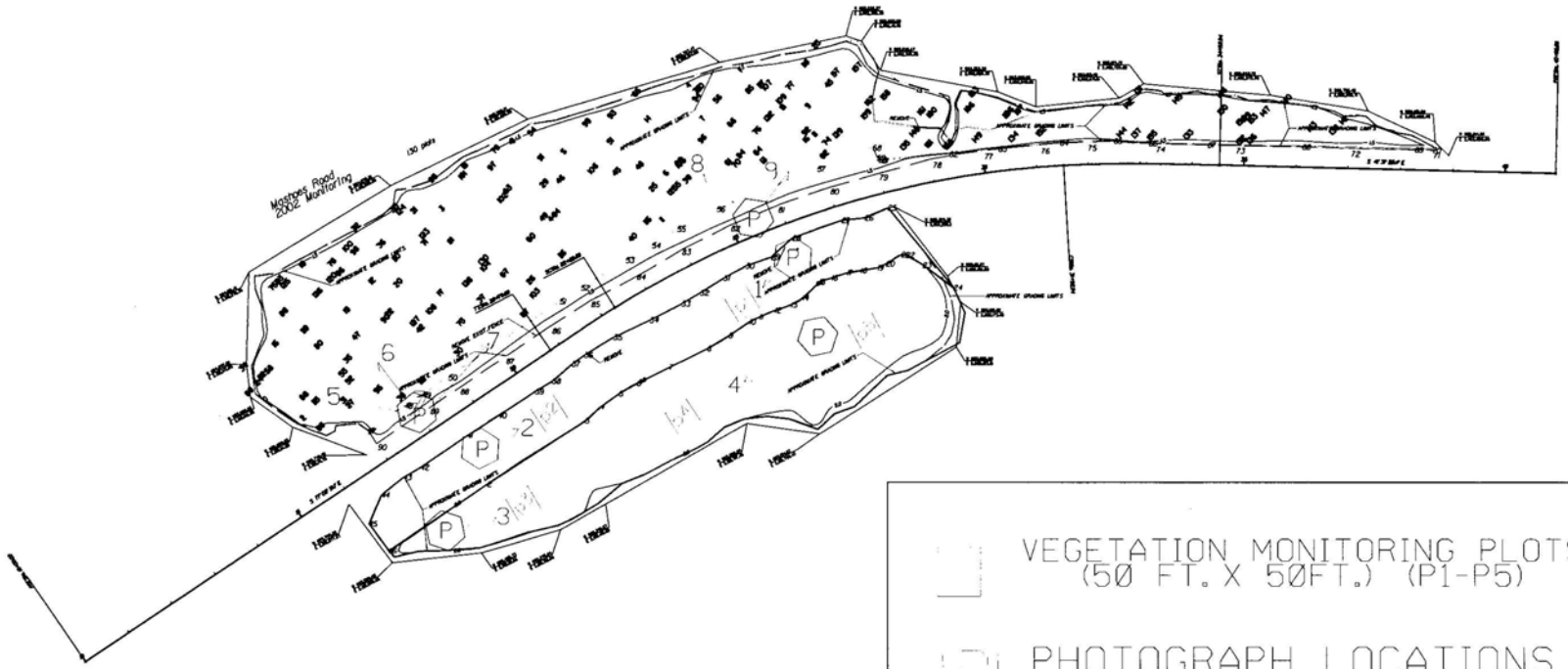
Dare County, North Carolina
Mashoes Road Mitigation Site
Planting Plan



PROJ. REFERENCE NO.	SHEET NO.	TOTAL SHEETS
R-2551WM	WM-1	
STATE PROJECT NO.	F.A. PROJ. NO.	DESCRIPTION

CARE COUNTY, NORTH CAROLINA
MARSH'S ROAD MITIGATION SITE

Photo and Vegetation Plot Locations



VEGETATION MONITORING PLOTS
(50 FT. X 50FT.) (P1-P5)

PHOTOGRAPH LOCATIONS

Mashoes Road - Photos

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Mashoes Road - Photos

Photo 7

Photo 8

Photo 9